COMPUTER LITERACY

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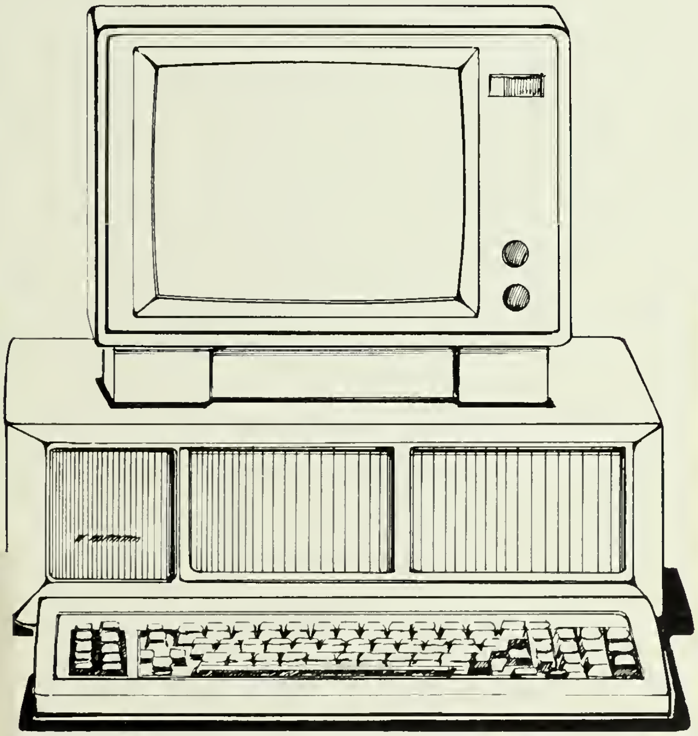

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COMPUTER LITERACY

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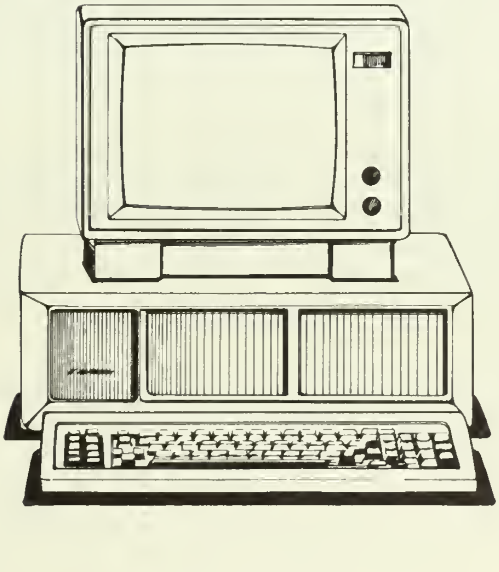

ACKNOWLEDGEMENTS

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NOTE: This publication is a service document. The advice and direction offered is suggestive except where it duplicates or paraphrases the contents of the Program of Studies. In these instances, the content is in the same distinctive manner as this notice so that the reader may readily identify all prescriptive statements or segments of the document.

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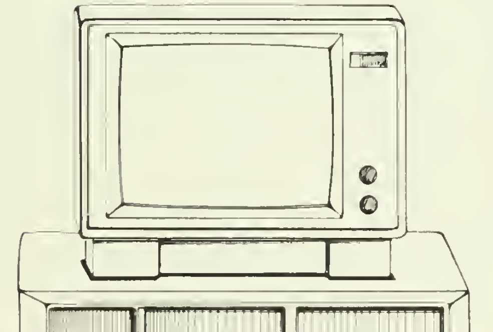
THE COMPUTER LITERACY PROGRAM



THE COMPUTER LITERACY PROGRAM

Introduction

The computer literacy program was developed in response to needs expressed by educators in the field and the resolutions passed by the Curriculum Policies Board at its meeting in November, 1980. In March, 1981, a committee was convened to compile a number of recommendations pertaining to the introduction of computer literacy in the Alberta curriculum. These recommendations reflected the view of school system representatives, the chairpersons of various subject area curriculum coordinating committees, and representatives of Alberta Education and ACCESS. The program is also in response to the recommendations contained in the report of the Minister's Task Force on Computers in Schools, released in June, 1983.

Computer Literacy 10 is a basic introductory course developed in response to the need to acquaint high school students with a general understanding of computers and their use. The course has been designed in conjunction with computer literacy programs introduced at both the elementary and junior high levels. Additionally, the course has taken into consideration other courses in computer studies, primarily Computer Processing 10-20-30, offered at the high school level. An effort has been made to coordinate and minimize content overlap with other programs and to accommodate students with or without previous computer experience.

Rationale and Philosophy

For thirty years there has been a steady improvement in the performance of digital electronic components and a corresponding growth in the power of computer systems. The development and widespread use of large-scale integrated circuits that can be mass produced for a few cents has made it possible to build computers and other microelectronic systems in large numbers at low enough costs to open a mass market. The cost-effectiveness of computing has increased more than a million times in the period following World War II.

During the next few years, microelectronic intelligence is likely to be incorporated into a large number of household and industrial products. Many of these products will become linked together by a worldwide communications system into a vast network that will dominate our lives and fundamentally change the world in which we live. Humankind is witnessing the transformation of the industrial society based upon energy into the electronic society based upon information.

This transformation is creating the greatest occupational upheaval in history. Many people will emerge from this upheaval permanently unemployable. At the same time, there will be a critical shortage of advanced skills, most of them associated with microprocessors and their applications. There will be a need for the entire population to be computer literate, and unless such literacy is imparted from early childhood, a substantial part of the population may find that they lack the basic skills needed to get along in their daily lives.

As the specific skills, knowledge and attitudes required to be computer literate will vary with time and with the students' level of computer expertise, the definition of computer literacy should remain flexible and dynamic. The following functional definition presents the elements that form the basis for the provincial computer literacy program:

> *To be computer literate one must be able to describe, demonstrate and/or discuss (critically) how computers are used; how computers do their work; how computers are programmed; how to use a computer and how computers affect our society.*

The computer literacy program is based upon the following philosophical assumptions:

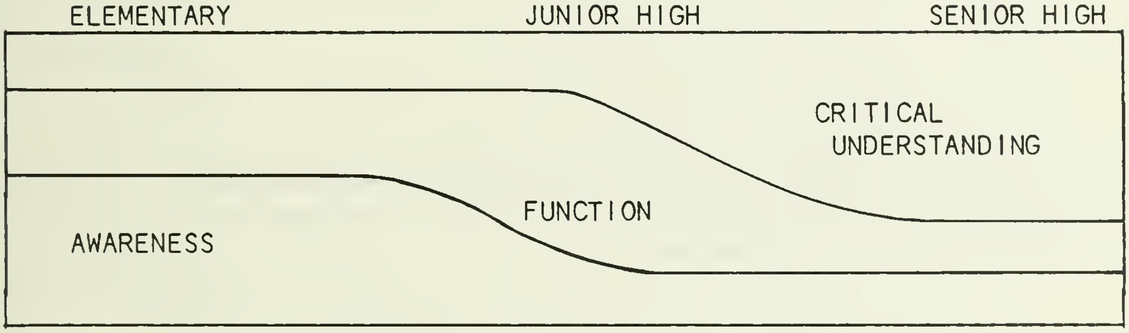
- as computer literacy is an aspect of general literacy required to function in our information-based society, all students should have the opportunity to become computer literate;

- since computers affect all subject areas, computer literacy should not be considered the specialization of one subject or group of educators. Interdisciplinary content and examples from various subject fields should be incorporated into the program;

- to become computer literate, each student must have "hands-on" computer experience;

- computer literacy encompasses three dimensions: awareness, function and critical understanding. These dimensions should be introduced to students in a manner appropriate to their developmental and ability levels. Although all dimensions should be addressed at each level, the elementary school unit should place a strong emphasis on an overall awareness of computers in society, including their applications in everyday life. The junior high component should foster a functional or working knowledge of computers and their capabilities for problem-solving. At the senior high level, the program should stress critical understanding of the implications and effects of the use of computers in society and how computers can directly and indirectly affect the individual.

The dimensions of computer literacy to be emphasized at each of the three levels of schooling are depicted in the continuum below:



Major Goals

The Computer Literacy 10 course is designed to contribute to the achievement of the goals for computer literacy in Alberta.

1. To develop student understanding of basic computer operations and terminology.
2. To develop an appreciation of the technological development of computer systems.
3. To develop student skills, attitudes and interests which facilitate the use of computer systems.
4. To have students appreciate that effective problem-solving with computer systems requires the application of logical thought processes and the development of the skills required for a holistic, systematic approach to problem-solving.
5. To have students appraise the applications, limitations and capabilities of computer systems.
6. To have students assess the current and potential impact of computer systems on society.
7. To develop student skills, attitudes and interests that will facilitate adaptation to changes in the workplace due to technological developments.
8. To promote a greater understanding and increase utilization of computer technology in other subject areas.

Students should be given the opportunity to explore as widely as possible, and be encouraged to pursue investigative activities based upon personal goals and interests.

Core-Elective Format

The program of studies consists of mandatory core and elective components. The core program consists of skills, concepts, interests and attitudes that are to be studied by all Computer Literacy 10 students in Alberta. The allocated time for teaching the core program component of this 3 credit course shall be 90% of the total time allotted for instruction.

The elective component provides an opportunity for teachers to choose from a variety of suggested topics in order to complete the program in the time given to this course. Teachers may select from chapters in textbooks, appropriate commercial resources, locally developed topics and student initiated projects. The intent of the elective component is to provide teachers with greater flexibility in planning their programs to meet student needs and interests and to utilize local resources. The elective time should be utilized to provide the necessary background knowledge and skills for students with no previous computer experience. Further information regarding the elective is provided in the section entitled Elective Component.

Core Topics

The Computer Literacy 10 course is organized around the following six core areas. These topics extend the computer experience offered at the junior high level but permit sufficient scope for students taking computer literacy for the first time. Elective topics build on the core themes and permit greater flexibility in the choice of subject matter that may be introduced in the classroom.

Topic 1: Computer Systems
Topic 2: Computer Operations
Topic 3: Computer Programming
Topic 4: Computer Applications
Topic 5: Societal Impact of Computers
Topic 6: Computers and Information Processing Careers

Provisions for Differences in Student Backgrounds

Provision for differences in student background and skill level in the use of computers upon entry into the program should be achieved through varying emphasis placed on core topics in the manner in which the elective is applied. For students with previous computer experience taking computer literacy, major emphasis should be placed on Topics 4, 5 and 6 to foster critical understanding of the implications and effects of computer use in society. The following emphasis is recommended:

Core:	Topics 1, 2, 3	-	25%
	Topics 4, 5, 6	-	65%
Elective:		-	10%

The elective should be used to expand the computer background and skill level of experienced students in areas of their own interest and strength.

For students with little or no previous computer experience it is recommended that equal time be devoted to the core topics with the elective time devoted primarily to meeting individual deficiencies in operational and programming skills. The following emphasis is recommended:

Core:	Topics 1, 2, 3	-	45%
	Topics 4, 5, 6	-	45%
Elective:		-	10%

Course Implementation

Successful implementation of the Computer Literacy 10 course is dependent upon the extent to which planning for implementation has taken place at the district and/or school levels. School administrators should consider provisions for teacher inservice, organization for instruction, facilities, availability of hardware and software, and differences in student background. It is highly recommended that the Alberta Education publication *Implementing Computer Literacy Programs In Schools* be consulted for information and guidelines concerning program implementation.

Hardware and Software Requirements

To allow each student the opportunity to participate in hands-on computer experiences necessary to achieve the core components of the course, a minimum of one work station (one computer, one monitor, one floppy disk drive) per three students who have not had previous experience. If the class composition is such that the majority of students have had previous computer experiences, a higher ratio of students to work stations could be considered. It is important, in either case, that access to computers be carefully considered prior to a decision to offer the course. Students' previous background, and class enrollments are critical to organization and success in meeting the goals established for the program. It is advisable that a minimum of one printer per class be used. However, the efficiency of achieving printing requirements would be greatly enhanced with additional printer units. Administrators are also advised to consult the Building Quality Restoration Program (BQRP) guidelines for business education in planning computer work stations.

Software* to accompany the course should include one or more of the following programs:

- data management program
- word processing program
- spreadsheet program
- simulation packages
- graphic processor
- music processor
- integrative software

*Commercial software to supplement the course is under review by Alberta Education.

Methodology

The development of functional knowledge through hands-on experiences with a computer should be the primary focus of the senior high computer literacy course. Some of the most effective learning about programming may occur when students experiment with existing programs and examine the consequences of modifying statements, or develop short computer programs to solve simple problems. Solutions to problems should be developed through the application of logical thought processes rather than through trial and error at the computer keyboard.

Since the recommended amount of hardware is substantially less than the number of students, all students will not be engaged in the same activity at the same time. A portion of the work students will do at the computer may be done in small groups of two or three. This may reduce frustration among students who are experiencing difficulties working with the computer, develop interpersonal skills, and assist students in arriving at solutions to problems that might otherwise require teacher intervention. When grouping students, teachers should consider the students' experiences and skills. The group method is time and cost effective, and may contribute to a more positive attitude about computers and programming.

Recognizing that only a portion of the class can be engaged in independent work at the computers at any one time, the rest of the students may participate in a variety of activities that contribute to the achievement of the objectives of the course. Suggested activities include small group work, overhead presentations, viewing of audiovisual materials, and research projects. This should minimize the frustration of students and avoid having them wait impatiently for time at a computer. Instructional strategies and materials should accommodate individual differences and allow for students to learn at a rate with which they feel comfortable. Careful organization is essential if the classroom is to be adaptable to this variety of activities. The computer stations or laboratory should also be located so as to minimize distraction of students engaged in other activities.

Learning Resources

The following resources* have been approved for the course:

Prescribed: (Print)

For core Topics 1, 2 and 3:

McRitchie, Margaret. Programming in BASIC: A Complete Course. Toronto: Holt, Rinehart and Winston, 1982, Chapters one to six.

and ONE of the following texts for Topics 4, 5 and 6:

Kelly, Rob. The World of Computers and Information Processing. Toronto: John Wiley and Sons, 1982.

Sanders, Donald H. Computers Today. New York, New York: McGraw-Hill Ryerson.

Shelly, Gary B., and Cashman, Thomas J. Introduction to Computers and Data Processing. Brea, California: Anaheim Publishing Company, 1980.

Note: At the time of the printing of this guide, software programs were still under review by Alberta Education. Schools will be advised of software authorizations at a later date.

CORE COMPONENT

SENIOR HIGH COMPUTER LITERACY 10

Core Components

Topic 1: Computer Systems

Goals:
1. To develop student understanding of basic computer operations and terminology.
2. To develop an appreciation of the technological development of computer systems.

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
The student will:		
1.0 DESCRIBE THE BASIC OPERATIONS AND HISTORY OF COMPUTER SYSTEMS.		
1.1 Recognize and use computer terms.	A	Review terminology from the elementary unit and the junior high course or introduce as required. Additional terms: computer networking, data base, interactive data processing, word processing, information retrieval, artificial intelligence, robot, android, cyberg, cybernetics, videotex, teletex, interface, laser, holography, synthesizer, speech recognition device, bubble memory, cashless society, encryption, Electronic Funds Transfer, firmware, megabyte, videodisc, simulation, computer revolution, expert system, and new BASIC commands from Topic 3.
1.2 Describe the role played in a computer system by people, software, hardware, data, documentation and communications.	A	Each of these components is an essential element in the successful operation of the computer systems being utilized in many areas of society.
1.3 Briefly describe the historical development of computer devices.	AR	Technological changes have influenced the design and capabilities of computers and will affect future computer developments. Comment: Stress should be placed on the trends rather than the details of technological developments.

NOTE: Dimension Codes -- A = Awareness; F = Function; U = Critical Understanding.
Status Code -- R = Review (covered in Junior High course)
Hands-On Required -- *

Topic 2: Computer Operations

Goal: To develop student skills, attitudes and interests which facilitate the use of computer systems.

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
The student will:		
2.0 PROCESS INFORMATION BY UTILIZING A COMPUTER SYSTEM.		
2.1 Demonstrate responsible behavior in utilizing a computer system.	FR*	Concepts/skills from the junior high course should be reviewed.
2.2 Utilize system commands DOS with prepared programs and available hardware.	FR*	Concepts/skills from the junior high course should be reviewed. A variety of software is available to assist in the execution of a given task.

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Hands-On Required -- *

Topic 3: Computer Programming

Goal: To have students appreciate that effective problem-solving with computer systems requires the application of logical thought processes and develop the skills required for a holistic, systematic approach to problem-solving.

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
The student will:		
3.0 FOLLOW AN ORDERLY SEQUENCE OF STEPS TO DEVELOP A COMPUTER PROGRAM TO SOLVE A PARTICULAR PROBLEM.		
3.1 Explain the existence of several variations of the BASIC language.	A	Differences in microprocessors and Disk Operating System limit compatibility of computer software.
3.2 Describe distinguishing characteristics of different data types.	A	Some data types include integer data, floating point, and alpha-numeric.
3.3 Code a given procedure (algorithm) into a computer program.	FR*	Skills to be reviewed from junior high or introduced as required include: - applying flowcharting concepts, logic and good programming techniques. - using NEW, SAVE, LIST, DELETE, LOCK, UNLOCK commands or their equivalent in another computer language - using alphanumeric variables and meaningful variable names in a computer program. - applying the rules governing order of evaluation of mathematical operators - providing brief documentation for computer programs (e.g., problem statement, flowcharts, REM statements) - producing readable output through appropriate formatting. - using BASIC statements: LET, PRINT, INPUT, IF/THEN, GOTO, END, STOP, or their equivalent in another computer language - using relation symbols (< > =) - using graphics
	F*	New skills include: - using FOR/NEXT statements, nested loops, READ/DATA, GOSUB, GET, STEP or their equivalent in another computer language - using cursor control keys for editing - controlling a variety of peripheral devices within a computer program.

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Hands-On Required -- *

Topic 3: Computer Programming (cont'd)

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
3.4 Be able to analyze computer programs.	FR*	Programs should be tested and debugged and the results checked for correctness. Logic, data and/or syntax errors may occur in programs. Programs should be modified to accomplish a new but related task.
3.5 Display confidence in his/her ability to use and control computers.	F*	Each student should independently design and successfully demonstrate a computer program.

NOTE: Dimension Codes -- A = Awareness; F = Function; U = Critical Understanding.
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Hands-On Required -- *

Topic 4: Computer Applications

Goal: 1. To have students appraise the applications, limitations and capabilities of computer systems.

2. To promote a greater understanding and increase utilization of computer technology in other subject areas.

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
The student will:		
4.0 UNDERSTAND THE APPLICATIONS, LIMITATIONS, AND CAPABILITIES OF COMPUTERS.		
4.1 Identify specific tasks performed by computers in various areas of society.	AR	There are many tasks appropriate for computer application in various areas of society. Some problems require computer use while others do not. Computers are controlled by programs and can only do what people instruct them to do. Innovations in hardware and software continually expand the uses of computers.
4.2 Describe ways in which information may be retrieved from data bases.	A	The retrieval and sending of data may involve radio, television, telephone, satellite, cable networks. Teletex, videotex systems and information retrieval bases are in use in Europe, North America, and Japan.
4.3 Describe factors that limit computer use.	U	Cost, software, storage capacity, hardware speed and compatibility, legal constraints, and people's attitudes may limit the use of computers.
4.4 Describe how computers are used to control other machines and devices.	U	Rapid developments are occurring in the fields of robotics and cybernetics. See also objective 5.5.

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OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
4.5 Manipulate information using a commercially prepared interactive data processing program.	F*	Students should use an interactive data processing package, such as: Data base programs may be used for a variety of applications including inventory control, personnel records, accounting and customer files. Students using data base programs should start a new file and add, edit, delete, search for, and print records. AND/OR Word processors may be used by students for compositions in various subject areas. AND/OR Students can use an electronic spread sheet in a selected project: personal budget, income taxes, running a small business (school canteen or store), projecting various rates of inflation, calculating mortgage payments at various rates of interest. AND/OR Students may use a simulation in various subject areas (e.g., music and graphic processors) and/or investigate capabilities of integrative software.

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Hands-On Required -- *

Topic 5: The Societal Impact of Computers

Goal: To have students assess the current and potential impact of computer systems on society.

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
The student will:		
5.0 APPRECIATE THE IMPACT THAT COMPUTERS CAN HAVE ON OUR LIFESTYLE.		
5.1 Identify factors that contribute to our increasing dependence on computer based systems.	U	Factors such as the following should be identified: Costs of hardware are decreasing while capabilities are increasing (cost-benefit ratio). Business institutions must utilize technology to keep pace with the competition. We are currently witnessing the shift from an industrial/energy based society to an information society (computer revolution). The need for efficiency in utilization of scarce resources may force us to adapt to an information based society. Computers can eliminate boring, repetitive jobs. The amount of information made available through the use of electronic technology prevents any individual from maintaining complete knowledge of his/her subject field.
5.2 Assess the impact that computers have in the distribution and use of economic, social and political power.	U	Computer impacts such as the following should be identified:
	U	Access to current information is a powerful asset for economic and political institutions. Technological developments could permit instant polling and direct consumer and citizen input into decision-making. An increasing proportion of our economy is dependent upon information technology. What are the implications of developing a "cashless society"? Computer technology, coupled with new telecommunication devices and mass data storage facilities could permit surveillance of citizens, major changes in the formal education system, and a shift of the populace from urban to rural environments.

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Topic 5: The Societal Impact of Computers (cont'd)

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
5.2 Assess the impact that compuers have in the distribution and use of economic, social and political power. (Cont'd)	U	The new information technologies could have a major impact on traditional media. Information technology affects the reporting of current events, world governments, international standards and the exploration of space and the ocean. Will access to information technology widen the gap between developed and developing nations? Electronic technology permits new forms of entertainment, communication and lifestyles. Will we become economically and psychologically dependent upon this technology?
5.3 Assess the impact of computers on the work place.	U	Computer impacts such as the following should be identified: Computers are causing changes in the availability and type of jobs. Shifts in employment patterns will have psychological as well as economic effects. Electronic technology could foster a decentralization of the work place (cottage industry). Retaining programs may be required for people displaced by technological change. New employment opportunities may be available for disabled people. Both labor unions and management may have different roles in an information based society. Technological innovations could allow shorter and more flexible work hours, fostering an expansion of the recreation industries. Surveillance of productivity and employees is facilitated by electronic technology. There may be health and safety risks involved when using electronic technology in the work place. How can the benefits of automation be shared throughout all levels of society?
5.4 Distinguish between human capabilities and computer capabilities.	U	Capabilities such as the following should be identified: Human beings have intuitive and creative abilities, emotions, complex language and social skills, senses, and the ability to make value judgements. Humans are capable of nonlinear, time independent, nonsequential, random and pattern oriented thought. Computers are best suited for tasks requiring speed, accuracy, repeated operations, and processing of large amounts of data.

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OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
5.4 Distinguish between human capabilities and computer capabilities. (Cont'd)	U	Computers are primarily capable of linear, time sequential, non-intuitive, structured and incremental learning. Humans and computers are interdependent in an information based society.
5.5 Describe the current and potential uses of artificial intelligence.	U	Issues such as the followings should be identified: Computers were developed by human beings and represent an imperfect reflection of human intelligence. As we move computers from a linear, left brain orientation into the right brain realm of inference and intuition, computers could simulate many human intellectual activities. Only the most basic intelligent human behaviors have been incorporated into computer programs and related hardware (e.g., robots and androids). Artificial intelligence is a simulation of "humanness" by electronic computers. It includes a number of areas such as natural language processing, problem solving and pattern recognition. Cybernetics is the comparative study of the automatic control system formed by the nervous system and brain and the control system of electromechanical communication systems and devices. Cybernetics examines the relationship between humans and machines. Intelligent machines/devices could obey our spoken commands and answer our questions, control artificial limbs and organs or act as a companion for the lonely or elderly. Microprocessors implanted in our bodies could give us better memory, or relieve pain, deafness, blindness or augment our senses so that we can have telescopic vision, see x-rays or infra-red, or hear radio waves. As computers become able to replace/extend human senses, left brain and motor functions, human beings may gain additional economic/social value from their creative abilities. Will the implanting of microprocessors in the human body alter our concept of "humankind"? What are the moral-ethical implications of implanting microprocessors in human beings?

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Hands-On Required -- *

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
5.6 Propose an appropriate role for computers in society. (Cont'd)	U	Issues such as the following should be identified: There are risks involved in utilizing computer systems: Economic - high unemployment and retraining costs - dependency on computers necessitates high cost contingency plans for emergency situations - economic decisions may be based upon erroneous computer data or programs - some organizations may be unable to keep pace with rapid technological change Personal - increase in stress potential due to rapid technological change - some health problems/diseases may be associated with use of computer systems Defense - increasing dependence upon computerized defence mechanisms could create enormous problems for humankind if there are errors in programs or equipment Communications - errors in transmission of electronic data or the breakdown of computer systems may have serious economic, political and personal consequences. There are numerous issues related to privacy and security in the use of computerized information systems: - What is privacy and do we have a right to privacy within the Canadian Constitution? - How does the concept of "privacy" relate to the political system of a nation? - What information is contained in large data banks? - What are universal identifiers and how could they be used to access information in data banks? - How reliable is data bank information? - Who owns the information on file? - Who should have access to the information? - Who decides how the information should be stored? - Who decides how the information is used? - What benefits are associated with storage of personal information? Some regulatory procedures help to insure integrity of personal data files located in Canada: - Privacy Act (Bill C-43, 1982) - Access to Information Act (Bill C-43, 1982) - citizen use of Access Register (1983) - Office of the Privacy Commissioner and/or ombudsman - use of passwords, numbers, protected files, encryption codes and other electronic controls - industry self-regulation - judicial challenges based upon the Canadian Constitution (Canadian Charter of Rights and Freedoms) and other government legislation Are these procedures adequate to preserve our right to privacy?

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Hands-On Required -- *

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
5.6 Propose an appropriate role for computers in society. (Cont'd)	U	Are laws governing freedom of access to information incompatible with the right to privacy? What regulatory procedures are used in other countries to insure integrity of personal data files? Can computers be used by knowledgeable criminals to steal money or information? How could this information be used by interested parties? Do computer scientists, operators, etc. face significant moral issues when developing computer programs or hardware, or operating data banks? What regulatory procedures and other means could prevent the misuse of computers in society? Could people's values be in conflict with computer applications? As technology permits an international dissemination of information, regulation of information flow is complicated by differences in national laws regarding privacy, copyright, and espionage. Do extradition treaties and reciprocal agreements apply to cases involving misuse of information?

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Status Code -- R = Review (covered in Junior High course)
Hands-On Required -- *

Topic 6: Computer and Information Processing Careers

Goal: To develop skills, attitudes and interests that will facilitate adaptation to changes in the workplace due to computer technological developments.

OBJECTIVES	DIMENSION STATUS	CONCEPTS/SKILLS/COMMENTS
The student will:		
6.0 INVESTIGATE COMPUTER AND INFORMATION PROCESSING CAREERS.		
6.1 Identify careers directly involved with the computer and information processing industries and project future career choices.	A	Major categories of computer careers include data preparation clerk, coding clerk, computer operator, programmer, systems analyst and consultant, tape librarian, maintenance engineer, data processing manager, data base manager, sales personnel.
6.2 Describe some careers in which computer skills are desirable.	A	See objectives 4.1 and 5.3. Examples include accountant, researcher auditor, manager, etc.

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Hands-On Required -- *

ELECTIVE COMPONENT

Notes Concerning the Elective

The elective component of the computer literacy program is a compulsory section of the course where students and teachers have some flexibility in determining what is to be studied and how it is to be studied. The topics covered should be related to the course in that they are based on overall objectives for the program.

Electives may be pursued utilizing several methods ranging from individual to group studies and from structured to open-ended investigations. Electives should be designed to make computer literacy interesting and meaningful through the assimilation of content and the study of contemporary computer related issues.

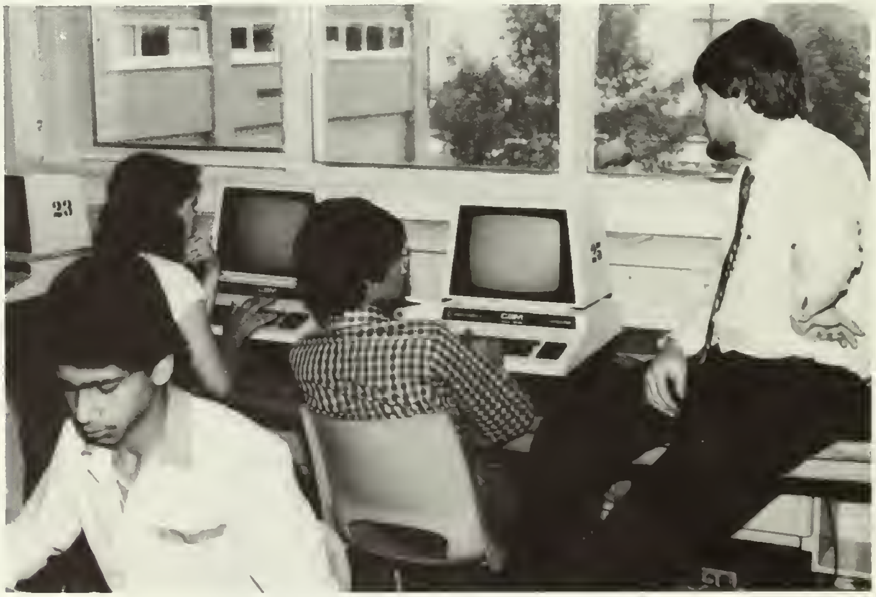
The elective component of the computer literacy program should be directed toward:

i. developing background knowledge, and the operational and programming skills of students with no previous computer experience

ii. extending and enriching particular skills and interests of students with computer experience either on an individual or group basis

iii. extension of concepts and skills related to core topics

Suggested instructional strategies for achieving the above include the use of periodicals/journals, self-developed computer programs (data processing, games, simulations) individual research projects and tutoring of other students.



Suggested Elective Topics

Topic 1: Computer Systems

OBJECTIVE	DIMENSION
The student will:	
Differentiate between analog and digital computers.	A
Describe how digital computers operate upon information which has been encoded in binary utilizing the base 2 number system.	A
Describe the components of a CPU and explain how it controls what a computer does.	A
Describe the characteristics and demonstrate proper use of secondary storage systems.	A
Distinguish between parallel and serial communications.	A
Contrast the advantages/disadvantages of various input/output devices.	A
Recognize types of user interaction (e.g., batch, interactive, distributive).	A
Describe the function of some communication technologies e.g., modem, acoustic coupler.	A
Identify that software includes operating systems, compilers and application (user) programs.	A
Identify factors that contributed to the evolution of computer systems (social, economic, geographical, technological).	A

NOTE: Dimension Codes -- A = Awareness; F = Functions;
U = Critical Understanding.
Status Code -- R = Review (covered in Junior High course)
Hands-On Required -- *

Topic 2: Computer Operations

OBJECTIVE	DIMENSION
The student will:	
Identify other Disk Operating Systems.	A
Explain the difference between two Disk Operating Systems.	A
Use two or more Disk Operating Systems.	F*

Topic 3: Computer Programming

OBJECTIVE	DIMENSION
The student will:	
Distinguish between high and low level computer languages.	A
Identify some common computer languages.	A
Describe the standard flow chart symbols.	A
Draw a flow chart to represent a solution to a problem.	F
Read and explain a flow chart.	F
Indicate knowledge of AND, OR, NOT logic by using it in a program (Boolean Logic).	F*
Use array variables in a program.	F*
Use DIM statements in a computer program.	F*
Use graphics and/or sound capabilities in a computer program.	F*

NOTE: Dimension Codes -- A = Awareness; F = Function;
U = Critical Understanding.
Status Code -- R = Review (covered in Junior High course)
Hands-On Required -- *

Topic 3: Computer Programming (Cont'd)

OBJECTIVE	DIMENSION
The student will:	
Use library functions (e.g., INT, SQR, RND) in a program.	F*
Use other programming statements in BASIC or in another computer language.	F*

Topic 4: Computer Applications

OBJECTIVE	DIMENSION
The student will:	
Describe where and how computer graphics and sound are used (e.g., art, music, etc.).	A
Describe several computerized sampling techniques and statistical methods used in the social sciences.	A
Describe the magnitude and changing nature of the computer market place.	A
Analyze factors to be considered when purchasing a computer system.	A
Use a computer simulation to demonstrate understanding of the effects/interaction/limitations of variables.	F, U*
Describe the time-sharing system of a large complex computer and the process of being on-line (suggested field trip and/or accessing an information retrieval system).	F*
Select, on the basis of program documentation and computer capabilities, a commercial program appropriate to the execution of a given task.	F*

NOTE: Dimension Codes -- A = Awareness; F = Function;
U = Critical Understanding.
Status Code -- R = Review (covered in Junior High course)
Hands-On Required -- *

Topic 5: The Societal Impact of Computers

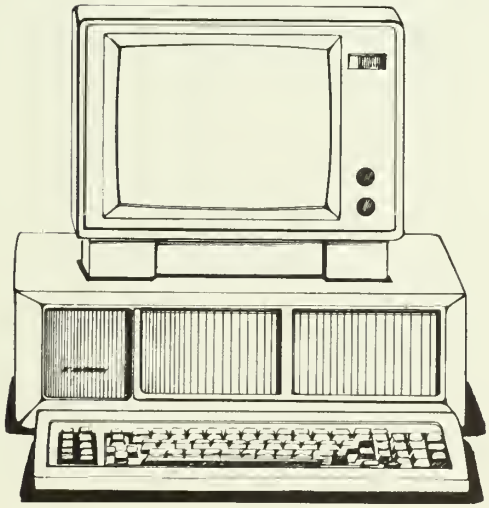
OBJECTIVE	DIMENSION
The student will:	
Analyze case studies on access to information and security of data.	A
Visit computer applications and installations in their geographical area. Report and share information collected.	A
Build a data base and manipulate the data to meet identified needs.	FA*

Topic 6: Information processing careers

OBJECTIVE	DIMENSION
The student will:	
Identify the educational requirements for specific computer careers.	A
Identify courses and programs which aid in preparation for information processing careers.	A
Report and share information on a computer career.	A
Identify typical employers of information processing personnel.	A
Visit computer installations to identify computer-related career opportunities. Report and share information collected.	A

NOTE: Dimension Codes -- A = Awareness; F = Function;
U = Critical Understanding.
Status Code -- R = Review (covered in Junior High course)
Hands-On Required -- *

CLASSROOM INSTRUCTIONAL NOTES



Evaluation

The final grade awarded to students should reflect the proportion of time spent on each core topic. This will vary depending on whether the student or class has had previous computer experience. The final grade must also include work completed in the elective component of the program.

Strategies for evaluation of student performance that may be effectively employed for this course include observation of student performance on the computer, pre- and post-attitude questionnaires, evaluation of student computer programs, written examinations and short quizzes, student participation in classroom discussion and student projects in addition to computer programs (e.g., research projects or written reports).

For some activities, students could check their own answers from a master sheet allowing the teacher more time to help students who are working at the computer or on other activities. Students may also assist each other in assessing their work.

Teachers should recognize that a variety of computer programs may provide a solution to a given problem and allow for individual differences in students' computer programs. However, standards should be clearly established for evaluating computer programs and these standards should be communicated in advance to all students. A sample checklist is provided on the following page.

SAMPLE ONLY

EVALUATION OF STUDENT-WRITTEN COMPUTER PROGRAMS

Name Mary Smith

Date Submitted ____________

Total Mark _____ / _____

PROGRAM NAME	/5	/2	/1	/2	
Mary Smith 1					/10
Mary Smith 2					/10
Mary Smith 3					/10
Mary Smith 4					/10
Mary Smith 5					/10
Mary Smith 6					/10
Mary Smith 7					/10
Mary Smith 8					/10
Mary Smith 9					/10
Mary Smith 10					/10

/5	Does the program WORK and how EFFICIENT is it? Is the printout as specified?
/2	Flowchart? Problem statement? Other documentation?
/1	REM Statements for program identification, variables, commands?
/2	Is the program attractive to read? Title page? Additional features? User friendly?

Provisions for the Gifted and Talented

The computer literacy program offers many opportunities for gifted and talented students to develop and extend their natural abilities through the use of computers. For this category of students the instructional program should be flexible and should permit the pursuit of individual interests and skills through differentiated instruction and the use of independent research projects and activities. The elective affords the teacher additional time to challenge students in this regard.

One of the major aims in the education of gifted students is to develop their research, deductive and creative thinking skills. One strategy for fostering these skills would be to provide opportunities for students to plan and carry out independent projects either inside or outside of the classroom or school. Regular instructing may have to be modified to compensate for these students.

Handicapped and Learning Disabled

Beyond uses for basic computer literacy training, microcomputer technology can be an effective tool for helping the physically handicapped and learning disabled. It has tremendous potential in providing for individualized instruction as well as providing better channels of communication between learner, teacher and others.

The major considerations in using this technology with handicapped or learning disabled student should be their particular needs and capabilities. Assessing these needs and capabilities generally requires the services of specialist personnel and/or support agencies to ensure that this technology provides appropriate personalized aid. After this is established, it may be possible to provide other modes of individualized instruction.

An overview of special considerations, needs, aids and courseware is found in Willson, John J. *Courseware in Special Education*, Alberta Education, Planning Services, 1983. Copies of this publication have been provided to Alberta school jurisdictions.

APPENDICES

APPENDIX ONE

Correlation of Resources to Core Topics

Topic 1: Computer Systems

OBJECTIVES	PRESCRIBED RESOURCES	OTHER RESOURCES
1.1	Kelley - Glossary McRitchie - Chapter 1 Sanders - Glossary Shelly and Cashman - Glossary	Curriculum Guides for Elementary and Junior High Computer Literacy.
1.2	Kelley - Chapter 1, pp. 2-14; 5 McRitchie - Chapter 1, pp. 4-9 Sanders - Chapter 1, pp. 3-33; 3 Shelly and Cashman - Chapter 1; 3, pp. 3.1 - 3.12	Computer Hardware: What It Is and How It Works Crawford - Chapter 1; 15; 16; 17; 18
1.3	Kelley - Chapter 1, pp. 15-22 McRitchie - Chapter 1, pp. 1-4; 9 Sanders - Chapter 1, pp. 34-39; 4, pp. 101-103 Shelly and Cashman - Chapter 2, pp. 2.1 - 2.31; 4, pp. 4.13 - 4.19	

Topic 2: Computer Operations

OBJECTIVES	PRESCRIBED RESOURCES	OTHER RESOURCES
2.1	Sanders - Chapter 1, pp. 5-8	Computer manuals.
2.2	Kelly - Chapter 4, pp. 78 McRitchie - Chapter 2, pp. 12-17 Sanders - Chapter 14, pp. 392-394	Commercial or teacher prepared educational courseware. System master or utility disk. Computer manuals. Crawford - Chapter 1

Topic 3: Computer Programming

OBJECTIVES	PRESCRIBED RESOURCES	OTHER RESOURCES
3.1	Kelley - Chapter 2, pp. 36; 4, pp. 76 McRitchie - Chapter 1, pp. 9 Sanders - Chapter 7, pp. 208-209; 13, pp. 368, 371; 14, pp. 439-441 Shelly and Cashman - Chapter 12, pp. 12.14 - 12.16	
3.2	Kelley - Chapter 4, pp. 77, 86 McRitchie - Chapter 2, pp. 35 Sanders - Chapter 14, pp. 397 Shelly and Cashman - Appendix A, pp. A.2	
3.3	Kelley - Chapter 4; 9, pp. 194-204 McRitchie - Chapter 2; 3; 4; 5; 6 Sanders - Chapter 12, pp. 319-326; Chapter 14 Shelly and Cashman - Appendix A, pp. A.1 - A.39	BASIC Training BASIC for Microcomputers Crawford - Chapter 3; 4; 5; 6; 7
3.4	Kelley - Chapter 4, pp. 79 McRitchie - Chapter 2, pp. 16-20 Sanders - Chapter 13, pp. 382-385; 14, pp. 399-400	

Topic 4: Computer Applications

OBJECTIVES	PRESCRIBED RESOURCES	OTHER RESOURCES
4.1	Kelley - Chapter 9, pp. 185-193; 12 Sanders - Chapter 2 Shelly and Cashman - Chapter 1, pp. 1.19 - 1.29; Chapter 2, pp. 2.31 - 2.45; Chapter 3, pp. 3.13 - 3.23; Chapter 5, pp. 5.23 - 5.33; Chapter 8, pp. 8.30 - 8.31	Field trips Current periodicals Crawford - Chapter 12; 20; 21
4.2	Kelley - Chapter 1, pp. 20 Sanders - Chapter 10; 17 Shelly and Cashman - Chapter 3, pp. 3.13 - 3.23; 8; 9	Crawford - Chapter 9 Telidon
4.3	Kelley - Chapter 6; 7; 8; 18 Sanders - Chapter 1, pp. 29-32; 21, pp. 646-647 Shelly and Cashman - Chapter 5; 6; 7	
4.4	Kelley - Chapter 12; 18 Sanders - pp. 93, 569, 597, 646-647	Crawford - Chapter 21
4.5	Word processing program Data base management program Sanders - Chapter 17 Electronic spreadsheet program Simulations	Spreadsheet Concepts and Applications Manuals accompanying programs. Crawford - Chapter 19

Topic 5: Societal Impact of Computers

OBJECTIVES	PRESCRIBED RESOURCES	OTHER RESOURCES
5.1	Kelley - Chapter 1, pp. 2-14; 9, pp. 185-193; 13; 17; 18 Sanders - Chapter 20 Shelly and Cashman - content to support Topic 5 objectives is located in Chapter 13 and in a section titled "Controversial issues in data processing" found at the end of each chapter.	Goodbye Gutenberg The Information Revolution and Its Implications for Canada The Silicon Factor - Part 1 Crawford - Chapter 8
5.2	Kelley - same as 5.1 Sanders - Chapter 19; 20	Goodbye Gutenberg
5.3	Kelley - Chapter 17; 18 Sanders - Chapters 4; 19	Crawford - Chapter 13; 14
5.4	Kelley - Chapter 17 Sanders - Chapter 19, pp. 552-555	Crawford - Chapter 22
5.5	Kelley - Chapter 10, pp. 230-231; 13, pp. 285-286; 17, pp. 372-375 Sanders - Chapter 19, pp. 552-555; 21, pp. 646-647	The Mind Machines Science fiction novels/stories Current periodicals
5.6	Kelley - Chapter 17; 18 Sanders - Chapter 19; 21	Crawford - Chapter 10; 11

Topic 6: Computer and Information Processing Careers

OBJECTIVES	PILOT RESOURCES	RECOMMENDED RESOURCES
6.1 and 6.2	Kelley - Chapter 1, pp. 9-14 Sanders - Chapter 19, pp. 583-587 Shelly and Cashman - Chapter 1, pp. 1.16 - 1.17; 10, pp. 10.1 - 10.6	Careers in Computer Science and Service. Computer Studies Careers section of current newspapers and computer periodicals. Field trips. Crawford - Chapter 14; 26

APPENDIX TWO

Additional information concerning learning resources and support materials.

1. McRitchie, Margaret. Programming in BASIC: A Complete Course. Toronto: Holt, Rinehart and Winston, 1982, Chapters one to six.

    The first six chapters of this softcover text cover most of the core objectives for Topic 3 of both of the senior high courses. Chapter I provides an introduction to computer systems, including computer terminology, while the next five chapters introduce system commands, variables and PRINT statements, flowcharting, formatting of output, mathematical operators and heirarchy of operations; and LET, INPUT, READ/DATA, RESTORE, GO TO, IF/THEN, FOR/NEXT statements. Sub-routines are covered in Chapter II and in the other texts listed as pilot resources. The numerous questions and exercises in each chapter of McRitchie's book provide ample opportunity for students to practise the concepts that are introduced.

    The solutions manual provides suggested answers to the questions and exercises presented in the student text.

2. Plus ONE of the following texts:

    Kelley, Rob. The World of Computers and Information Processing. Toronto: John Wiley & Sons, 1982, 404 pp.

    Designed by Rob Kelley, instructor of computer studies in Hamilton, Ontario, this hardcover text consists of 18 chapters covering programming, hardware, software, structured languages, societal impact, and computer applications. A variety of problem-solving and planning techniques are outlined with sample applications and assignments. Each chapter has a summary, review questions, advanced level questions, group and individual projects, and issues for discussion. The text is designed to allow flexibility in sequencing of chapters. Terminology is highlighted in bold print. A glossary and an index are included.

    The teacher's manual provides suggestions for adapting the text to local and curricular needs as well as objectives, and suggested answers to the review and applications questions in the student text.

Sanders, Donald H. Computers Today. New York, New York: McGraw-Hill Book Company, 1983, 669 pp. Canadian Distributor: McGraw-Hill Ryerson.

> Written by the author of six other books on computers, this very current hardcover text contains 21 chapters divided into five modules: introduction to computer concepts, computers at work and computer impact; computer hardware systems; computer software concepts (programming); information systems concepts; and societal impact. Each chapter contains an introduction, a narrative and colourful visual presentation of information, a summary, key terms and concepts, topics for discussion and review, an answer key to the review questions, and a short presentation on a selected computer topic (e.g., telecommunicating, career opportunities, system design errors, making decisions with data-base management systems, videotex systems). There is a glossary and an index. Most of the examples are American.
>
> The instructor's manual provides an overview, objectives, a teaching outline, answers/teaching suggestions for text review and discussion topics, questions for the short presentations on selected computer topics, and a bibliography of selected references for each chapter of the student text. There is also a section containing programs in other languages for an applications problem first introduced in Chapter 2, and dozens of transparency masters selected from the illustrations in the student text.

Shelly, Gary B., and Cashman, Thomas J. Introduction to Computers, Data Processing. Brea, California: Anaheim Publishing Company, 1980.

> The 13 sections of this colourfully illustrated softcover text include an introductory to computer systems, the evolution of the computer industry, processing data on a computer system, input-output and storage devices, data communications, distributed data processing, systems analysis and design, structured program design and flowcharting, a review of programming languages, coding and testing programs, and the future of computers in society. The appendices cover programming in BASIC, the coding of the 80 column card and number systems. There is a combined glossary/index. The text is American and geared to the business and data processing world. Teachers using this text for Computer Literacy 10 will have to obtain supplemental material for Topics 4 and 5 from the recommended and supplementary resources suggested in this guide, or from other appropriate resources.
>
> The teacher materials are very comprehensive and provide a large number of suggestions for teaching activities and student evaluation as well as possible answers/solutions to the exercises in the student text.

NON-FICTION MATERIALS

NOTE: These materials may not be available from the Alberta School Book Branch.

BASIC for Microcomputers. New York: Educational Activities Inc., 1979. (Five sound-filmstrips in colour, teacher's guide)

Topics covered are:

1. Getting started with the computer
2. Mathematical operations
3. Loops and sub-routines
4. Introduction to original programming
5. Programming techniques and flowcharts

BASIC Training. Electronic Data Systems Corporation, 1980. (Four thirty-minute colour videotapes accompanied by workbooks.) The videotapes may be ordered through ACCESS Media Resource Center, Calgary (program numbers are BPN 232301 - 232304). Support material can be purchased only through the Alberta School Book Branch.

Designed as an individualized instructional package, this series provides training for the beginner in microcomputer programming in the BASIC language. The titles in the series are:

Lesson 1 - includes instruction in writing and running a basic program, connecting and testing a small computer system, the cursor, use of return/enter key, string statements, error messages and line numbering.

Lesson 2 - focuses on LET, INPUT, GOTO, FOR-NEXT, STEP statements and multiple loops.

Lesson 3 - applies the statements described in the previous program to an actual project for the Balford Company and introduces IF-THEN, END, HOME statements and delayed loops.

Lesson 4 - introduces the concepts of random numbers, integers and sub-routines which are useful when applied to create simple game programs.

Careers in Computer Science and Service. Mount Kisco, New York: Center for Humanities, 1982. (Two sound-slide sets - 160 frames, 58 minutes, colour, teacher's guide. Filmstrip edition also available.)

> This series presents career-related opportunities in the computer industry. Part I presents an overview of computers, while the last three segments focus on hardware, software and operations. The program presents interviews with actual people at work, presenting specific careers from entry level through senior and management positions including information on education, experience, working conditions, salary and advancement potential for each position.

Computer Hardware: What It Is and How It Works. Mount Kisco, New York: The Center for Humanities, 1982. (Two sound-slide sets - 160 frames, 48 minutes, colour, teacher's guide. Filmstrip edition also available.)

> The program explains each step in a computer's operation, from input through information storage and processing to output, and describes typical microcomputers, as well as commonsense devices used at supermarkets, census bureaus, banks and utility companies. The actual processing of information in the computer's central processing unit is also illustrated.

Computer Studies, by Dave Garth and George Milbrandt. Toronto: Guidance Center, Faculty of Education, University of Toronto, 1982. (96 pp.)

> This Canadian resource is useful for introducing students to the wide range of computer careers in operations, programming, systems, data communications, data-base administration, technical and other fields.

Crawford, Tim, and Hook, Gail. Computer Literacy. Toronto: McGraw-Hill Ryerson Limited, 1982. (326 pp.)

> Authored by two Canadian teachers, this coil-bound book provides coverage of most of the Computer Literacy 10 and 10X objectives, but the pagination is nonstandard. The text is useful for extending concepts presented in this curriculum guide and for student projects/activities.

Goodbye Gutenberg. British Broadcasting Corporation, 1980. (One 75-minute colour videotape program) Available from ACCESS Media Resource Center, Calgary - BPN 239001.

> This program examines the startling impact of the information revolution brought about by the advent of the computer, suggesting that the cultural effects of this new technology will be just as dramatic as the invention of the printing press. The program illustrates how electronic text now replaces the printed word in most sectors of the information and communications industries.

The Information Revolution and Its Implications for Canada. Hull, Quebec: Canadian Government Publishing Center, 1981. (113 pp.)

A Canadian perspective on the impact of the information revolution on the workplace, our culture, privary, civil liberties and national sovereignty, is presented in chapters one to four. Chapter five examines comparable experiences/ concerns in other countries.

Logsdon, Tom. Computers and Social Controversy Workbook. Rockville, Maryland: Computer Science Press, 1980. (123 pp.)

Designed to accompany Logsdon's text (see Pilot Resources), this workbook provides chapter-by-chapter true/false, multiple choice and short answer quizzes to expand and reinforce the concepts and skills developed in the textbook. Each chapter also includes "press clippings" that promote critical understanding of the implications of computer use in society.

The Mind Machines. Time-Life Films, 1978. (Two thirty-minute colour 16mm films, teacher's guide.) Canadian Distributor: Marlin Motion Pictures.

Through interviews with scientists and science fiction authors as well as portrayals of "thinking" machines, this two-part film presents the possibility that man may build computers that can surpass the human brain in intellectual power. These "mind machines" would be devices capable of learning and judgement. Skeptics, however, contend that no computer will ever be able to cross the gap between calculation and judgement or understand language in the way humans understand language because of their background experiences. The teacher's guide provides questions to stimulate classroom discussion on artificial intelligence.

Sanders, Donald H. and Fry, Rob. Inside Computers Today: Study Guide to Accompany Computers Today. New York, New York: McGraw-Hill Inc., 1983. Canadian Distributor: McGraw-Hill Ryerson. (285 pp.)

Designed to accompany Sanders' text, this study guide includes learning objectives, overview and summary, key terms, multiple choice, true/false, completion questions and an answer key, for each corresponding chapter in the text.

Shelly, Gary B., and Cashman, Thomas J. Introduction to Computers and Data Processing Student Workbook and Study Guide. Brea, California: Anaheim Publishing Company, 1980.

Designed to be used in conjunction with the textbook (see Pilot Resources), this workbook provides a series of learning activities that assist the student in mastering the concepts presented in the textbook. Each section of the workbook includes chapter objectives, chapter overview, key terms, chapter projects, exercises for testing knowledge of chapter content and a computer laboratory project.

The Silicon Factor, Part 1: So What's It All About? British Broadcasting Corporation, 1980. (One forty-minute colour videotape.) Available from ACCESS Media Resource Center, Calgary - BPN 238301.

In this program, students witness the dramatic evolution of the silicon chip which in the last decade doubled in sophistication each year and see how an individual chip is manufactured. They also learn how this microelectronic circuitry is applied to much more than computers.

Spreadsheet Concepts and Applications, by ABS Materials. Toronto: Addison-Wesley Canada Ltd. Fall, 1983.

A tutorial mode is used in this series of ten exercises and ten projects which take students through elementary spreadsheet operations at their own rate. Each exercise introduces system's operations and theory while reviewing concepts necessary to complete the required tasks on a computer. The advanced mathematics functions are omitted as the tutorial is designed to expose students to spreadsheet concepts and applications and is not designed to test mathematical abilities. The author is a senior high school teacher from Alberta.

Telidon. Hull, Quebec: Canadian Government Publishing Center, 1980. (17 pp. pamphlet)

Through a combination of colour diagrams and narrative text, this pamphlet presents a brief overview of the basic components of the Canadian Telidon technology, the functions of the system and projections for future developments.

Periodicals useful to support this course can be found in:

Microcomputers: A Guide to Periodicals for Teachers, Librarians, and Media Specialists edited by K. Haycock, Association for Media and Technology in Education in Canada, Vancouver Community College Centred Administration, Bruce Maclean, 1155 East Broadway, Box 24700 Station C, Vancouver, B.C. V5T 4N4 ($2.00).

NOVELS AND SHORT STORIES

The following items are examples of resources that could be used to foster discussion of critical issues covered in Topic 5. The majority of the titles are available in both paperback and hardcover format from various publishers.

Asimov, Isaac. _I, Robot_. Various editions.

Clarke, Arthur. _The City and the Stars_. New American Library.
2001 - A Space Odyssey. New American Library.
2010 - Odyssey Two. Ballantine Books, 1982.

Crichton, Michael. _The Terminal Man_. Various editions.

*Huxley, Aldous. _Brave New World_. Various editions.

McCaffrey, Anne, "Dull Drums", from _Get Off the Unicorn_. Ballantine Books, 1977. (short story)

**Orwell, George. _Nineteen Eighty Four_. Various editions.

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* Listed as a Recommended novel for English 20

**Listed as a Recommended novel for English 30

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